CENTER FOR NUTRITION POLICY AND PROMOTION

The Healthy Eating Index

UNITED STATES DEPARTMENT OF AGRICULTURE
CNPP-1

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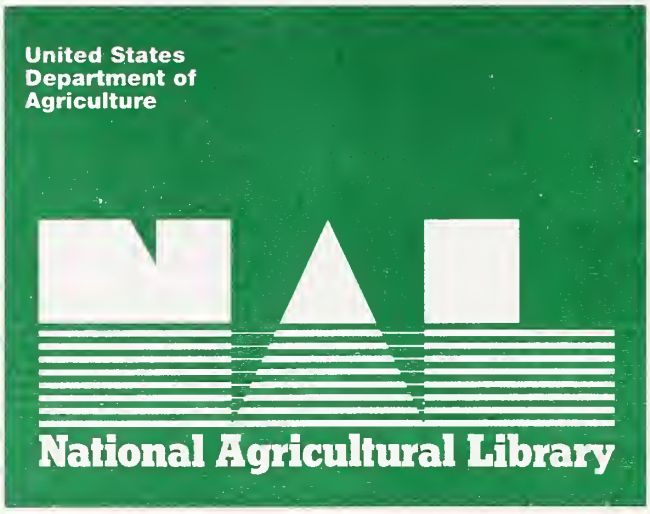

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Foreword

Nutrition is the bridge between agriculture and health. As the lead Federal agency for human nutrition, USDA fulfills its health responsibility through support for a healthful and abundant food supply, getting food to people who need it, and promoting healthy dietary choices.

Introducing the Healthy Eating Index, USDA is providing an important new tool for meeting our nutritional goals. It makes available for the first time a single summary measure to monitor changes in food consumption patterns.

The Healthy Eating Index measures how well the diets of all Americans conform to the recommendations of the Dietary Guidelines for Americans and the Food Guide Pyramid. It will serve as a report card on the American diet, allowing researchers to analyze how Americans eat, and aid USDA in developing more effective nutrition promotion messages for all our programs and for the general public.

The Healthy Eating Index was developed by the USDA Center for Nutrition Policy and Promotion (CNPP) under the direction of Dr. Eileen Kennedy, in cooperation with USDA's Food and Consumer Service and Agricultural Research Service. Within the Department, the Center serves as the focal point for linking scientific research to the nutritional needs of the American consumer.

Today, USDA is a recognized leader in nutrition and health. By increasing our knowledge of what we eat and why, and by better understanding the impact of food choices on our health, we will continue to strengthen the nutritional knowledge of our Nation.

Ellen Haas
Under Secretary
Food, Nutrition and Consumer Services

Executive Summary

Introduction

The role of nutrition and diet in reducing the risk of certain chronic diseases, such as cardiovascular disease, diabetes mellitus, and some forms of cancer, has been well documented. The Dietary Guidelines and Food Guide Pyramid recommend the selection of foods from a variety of food groups, the choice of a diet that is low in fat, saturated fat, and cholesterol, and moderate use of salt and sodium.

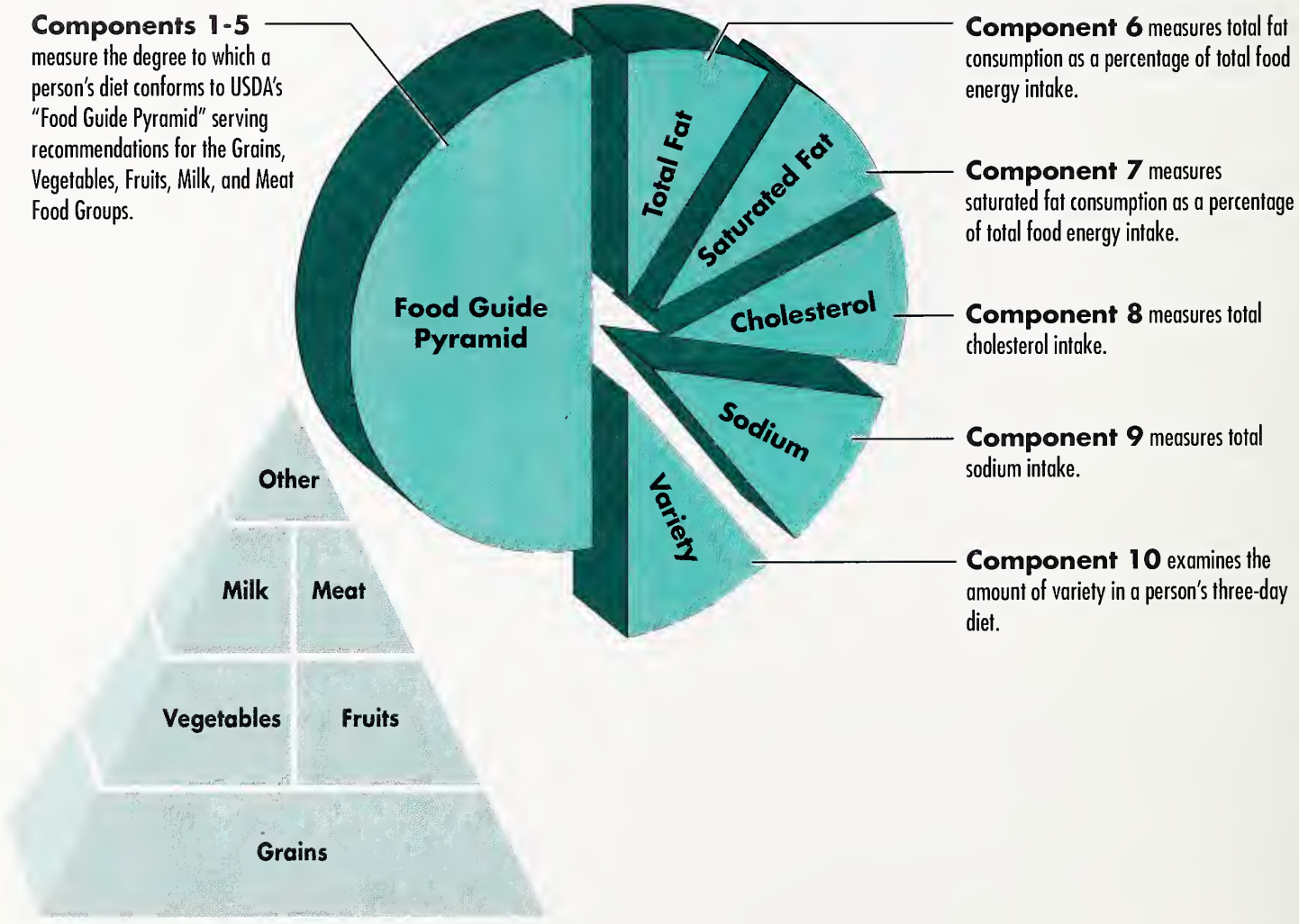
The average American diet does not meet these recommendations. The American diet is high in total fat and saturated fat and low in fiber and complex carbohydrates. In addition, there has been no regular reporting of how well Americans have been doing in improving consumption patterns. Thus, USDA developed the Healthy Eating Index to provide a single summary measure of dietary quality. Prior to this, some instruments had been developed which evaluated specific diet components such as fat and cholesterol. Few instruments have been developed, however, which assess overall dietary quality.

Methods

In an effort to measure how well American diets conform to recommended healthy eating patterns, the U.S. Department of Agriculture (USDA) has developed an index, called the Healthy Eating Index. Based on different aspects of a healthful diet, the Index is designed to provide a measure of overall dietary quality. The Index provides a picture of foods people are eating, the amount of variety in the diet and compliance with specific dietary guidelines recommendations. Ten dietary components have been identified and are shown below.

The overall Index has a total possible score ranging from zero to 100. Each of the 10 dietary components has a scoring range of zero to 10. Individuals with an intake at the recommended level received a maximum score of 10 points. A score of zero was assigned when no foods in a particular group were eaten. Intermediate scores were calculated proportionately.

The Healthy Eating Index was applied to the 1989 and 1990 USDA data from the Continuing Survey of Food Intake by Individuals. The data are based on representative samples of 3,997 individuals in 1989 and 3,466 individuals in 1990.



Findings

The higher the score on the Healthy Eating Index, the better the diet conformed to the *Dietary Guidelines for Americans* and the *Food Guide Pyramid*.

- The average Healthy Eating Index score was 63.8 and 63.9 out of a possible 100 for 1989 and 1990, respectively.
- Approximately 12 percent of people had Healthy Eating Index scores above 80; 14 percent of individuals had scores below 50.
- Approximately three-fourths of the people had scores on the Healthy Eating Index between 51 and 80.

Individual Components of the Healthy Eating Index:

The scores in the individual component categories of the Healthy Eating Index varied. Out of a possible score of 10, the average scores were as follows:

Item	Average Score
Grains	6.1
Vegetables	6.1
Fruits	4.0
Milk	6.7
Meat	7.5
Total Fat	6.3
Saturated Fat	5.0
Cholesterol	7.9
Sodium	7.0
Variety	7.0

Not only were a number of the average scores on the various components of the Healthy Eating Index low, but the percent of people meeting the recommended levels in any given category was also low. As shown in the table below:

Food Groups

- Less than one-third of the people in the study consumed the recommended servings of milk and meat.
- Fewer than one out of five people consumed the recommended servings of grains, vegetables and fruits.

Dietary Guidelines

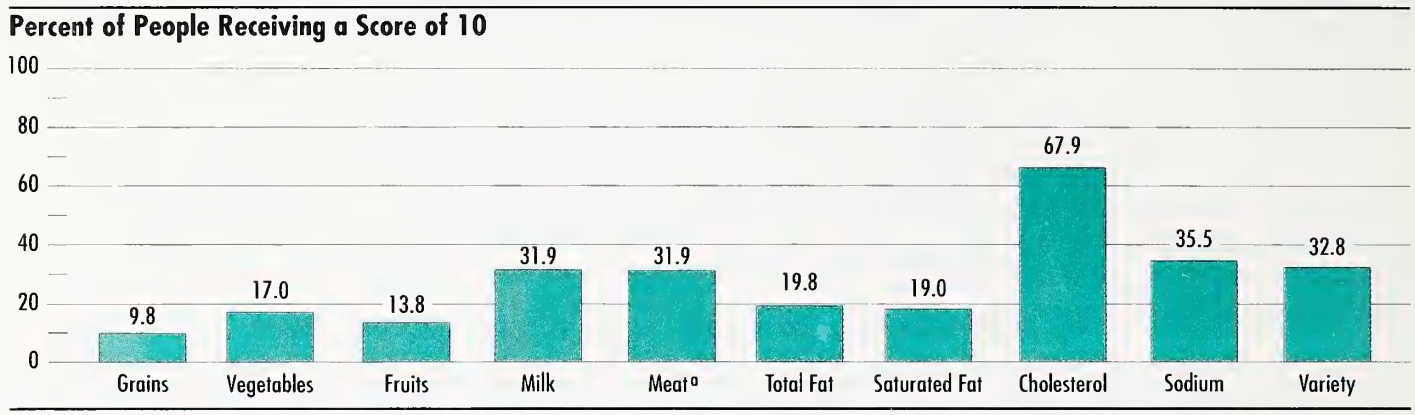
- Less than 20 percent of the sample achieved the recommendations of the *Dietary Guidelines for Americans* for total fat and saturated fat.
- Only 35 percent of the people met the recommendation for sodium.

Variety

- Less than one-third of the people achieved the recommended amount of variety in dietary patterns.

Table A

Levels of Healthy Eating Index Components[1]



[a]Includes eggs, nuts, and some legumes.
[1]1989 Weighted data; Individuals Ages 2+; 3-day data
Data from Continuing Survey of Food Intake by Individuals 1989 - U.S. Department of Agriculture.

Differences in the Healthy Eating Index by Individual and Household Characteristics:

There is an association between the Healthy Eating Index and a number of economic and demographic parameters:

Education

- A person's Healthy Eating Index improved with increasing education.

Income

- Increasing income had a modest effect on improving the Index. However, people in households below the poverty level had Healthy Eating Index scores lower than the overall average of the sample.

Gender/age

- Females tended to score higher on the Healthy Eating Index than did males. The Healthy Eating Index scores were higher for children and older people and lowest for persons in the 15 to 39 years of age category.

Relationship of the Healthy Eating Index to Nutrient Intake

- People with higher Healthy Eating Index scores were more likely to have better nutrient intake. For example, only 49.3 percent of persons with an Index score of 50 or below consumed more than 75 percent of the RDA for Vitamin C. In contrast, for persons with an Index score of 80 or above, 98.8 percent consumed more than 75 percent of the RDA for Vitamin C. Clearly, nutrient intake improved with an increasing Healthy Eating Index score.

Relationship of the Index to a Person's Self-Rating of His or Her Diet

- A comparison of Healthy Eating Index scores and a person's self-rating of his or her diet showed that individuals who rated their diet as "Excellent" had higher average scores on the Healthy Eating Index than individuals who rated their diets as "Good," "Fair" or "Poor."

Conclusions

• The diets of most Americans need improvement.

Only 12 percent of Americans had scores on the Healthy Eating Index that were 80 or above. The average scores for the 2 years studied were similar at 63.8 and 63.9. One-third or less of the people surveyed consumed the suggested number of servings from the 5 major food groups. People were most likely to underconsume in the fruit, vegetable and grain groups. In addition, variety in the diet was limited and intakes of total fat and saturated fat were above recommended levels for more than 80 percent of the individuals studied.

• Some individuals are more likely to consume a poor diet.

Although the average Healthy Eating Index score for most people needs improvement, some individuals are at a higher risk of a low Index. Persons from low-income households, individuals with less education, and persons in the 15 to 39 years of age category were most likely to have lower average scores on the Healthy Eating Index.

• The Index provides a standard for assessing overall dietary quality.

Based on the most current scientific information available, including the *Dietary Guidelines for Americans* published by USDA and DHHS, and the *Food Guide Pyramid*, the Index was developed to provide a single summary measure of dietary quality. The Index is based on the five major food groups from the *Food Guide Pyramid* and the *Dietary Guidelines*. The Index is a practical standard for assessing dietary quality.

The Index correlates well with other conventional measures of diet quality. Comparisons with RDA levels confirm a positive correlation between the Index and individual nutrient intake levels. Higher Index scores are associated with improved nutrient intakes.

• The Healthy Eating Index reflects the complexity of dietary patterns.

Ten dietary components comprise the Index. All 10 components contribute evenly to the overall Index score. Doing well on one component does not ensure a high score on the overall Index. Overall dietary quality is reflected in the total Index score and is not determined based on any individual component score. Using one component score, such as percent of calories from fat, as an indicator of dietary quality can result in misclassifications.

There is significant variation in average scores among the individual Index components. Fruits and saturated fat have the lowest average component scores, indicating that consumers are doing the poorest in these areas. Of all individuals, less than 20 percent achieved recommended levels in the grains, fruits, vegetables, total fat, and saturated fat components. Only in the cholesterol component did greater than 50 percent of individuals achieve a perfect score.

USDA Applications

Practical applications of the Healthy Eating Index results are identified below.

- **The results of the Index are useful in targeting nutrition education and health promotion activities.**

Results of the Index provide insights into the types of dietary changes needed to improve American eating patterns. A two-tiered approach is warranted. First, nutrition promotion activities are required to address the nutritional needs of all Americans. To that end, USDA is proposing a general nutrition education and nutrition promotion initiative for all Americans as part of the 1995 Farm Bill. In addition, the recently implemented Schools Meals Initiative for Healthy Children ensures that the nutrition standards for school meals meet the dietary guidelines. This is complemented by Team Nutrition which focuses on empowering children to make food choices for healthful diets.

Targeted strategies for nutrition promotion are also needed. Results from this research suggest that individuals from low-income households and less-educated people are more likely to score lower on the Healthy Eating Index. Therefore, efforts are already underway within USDA to integrate nutrition into all of the food assistance programs.

- **The Healthy Eating Index is a single summary measure of diet quality that can be used to monitor changes in food consumption patterns over time.**

In this study, the Index was applied to the 1989 and 1990 CSFII data to evaluate the overall quality of American diets. Average scores for the overall Index for both years are approximately 64 percent, a score judged as "Needs Improvement." HEI values are similar for both years, indicating that dietary intake does not vary greatly from year to year. USDA intends to use the Index as one method to monitor changes in dietary patterns in the United States population over time. The Index will be periodically published as nationally representative dietary survey data become available.

- **The Index could provide the basis for development of a variety of additional tools.**

The Healthy Eating Index provides one instrument that will be useful in monitoring trends in U.S. consumption patterns over time. This will provide policymakers with the capability of revising and fine-tuning specific programs in a more timely manner to be responsive to the changing nutrition profile of the population.

In addition, a self-assessment instrument would be of use to the American consumer in that it would provide a standard against which an individual could evaluate the quality of his/her own diet. In addition, a self-assessment instrument could serve as a useful guide to consumers in helping them select the types and amounts of foods needed to achieve recommended intakes. The Index would provide a basis for the development of such an instrument.

It is the intention of the USDA Center for Nutrition Policy and Promotion to begin developing a consumer-oriented, self-assessment guide following the public release of the Healthy Eating Index.

Table of Contents

Development of the Healthy Eating Index

Introduction

The role of nutrition and diet in reducing the risk of chronic diseases, such as cardiovascular disease, diabetes mellitus, and certain forms of cancer, has been well documented. Concerns about the influence of dietary practices on the health status of the country have been increasingly emphasized in a number of reports and guidelines, among them the *Dietary Guidelines for Americans* (U.S. Department of Agriculture and U.S. Department of Health and Human Services, 1980, 1985, 1990), *Healthy People 2000: National Health Promotion and Disease Prevention Objectives* (U.S. Department of Health and Human Services, 1990), *Surgeon General's Report on Nutrition and Health* (1988), and National Research Council's report on *Diet and Health* (1989).

Recommended dietary practices generally include the selection of foods from a variety of food groups, particularly the grain, fruit, and vegetable groups; choice of a diet that is low in fat, saturated fat, and cholesterol; and moderate use of salt and sodium.

Much of the previous research has focused on determining which eating patterns should be recommended to the public for reducing the risk of chronic disease. Future research needs to be directed at developing measures to assess overall dietary quality. Some analytical instruments have been developed which evaluate specific dietary components, such as fat and cholesterol. Few instruments have been developed, however, which assess the overall quality of a diet.

Methods

In an effort to measure how well American diets conform to recommended healthful eating patterns, the U.S. Department of Agriculture has developed an Index, called the Healthy Eating Index. The Index was designed to provide a measure of the overall quality of an individual's diet.

The Index provides a picture of foods people are eating, the amount of variety in the diet and compliance with specific Dietary Guidelines recommendations. In designing the Index, it was not intended that the dietary components be considered individually as indicators of overall dietary quality. A score on the Index reflects a sum total of the dietary components. The following 10 dietary components were included in the Index based on different aspects of a healthful diet (figure 1):

- Components 1 - 5 measure the degree to which a person's diet conforms to the *Food Guide Pyramid* serving recommendations for the Grain, Vegetable, Fruit, Milk, and Meat[a] Groups.
- Component 6 measures total fat consumption as a percentage of total food energy intake.
- Component 7 measures saturated fat consumption as a percentage of total food energy intake.
- Component 8 measures total cholesterol intake.
- Component 9 measures total sodium intake.
- Component 10 examines the amount of variety in a person's diet over a 3-day period.

The Index is a practical approach to measuring overall dietary quality in that it examines specific food behaviors which comprise dietary intake.

[a]Includes eggs, nuts and some legumes.

Figure 1

Components of Healthy Eating Index

Food Group	Range of Scores	Perfect Score of 10[1]
1. Grains	0 to 10	6 - 11 servings
2. Vegetables	0 to 10	3 - 5 servings
3. Fruits	0 to 10	2 - 4 servings
4. Milk	0 to 10	2 - 3 servings
5. Meat	0 to 10	2 - 3 servings
Dietary Guidelines		
6. Total fat	0 to 10	30% or less energy from fat
7. Saturated fat	0 to 10	Less than 10% energy from saturated fat
8. Cholesterol	0 to 10	300 mg. or less
9. Sodium	0 to 10	2400 mg. or less
10. Variety	0 to 10	16 different food items over 3-day period

[1]Depends an recommended Energy Intake - See Table 1; all amounts listed are based an a per day basis with the exceptian af faad variety.

Food Group Components of the Healthy Eating Index

The Healthy Eating Index examines dietary intake in relation to the five major groups in the *Food Guide Pyramid*. A range of servings is shown for the Grain Group, Vegetable Group, Fruit Group, Milk Group, and Meat Group. The number of recommended servings depends upon an individual's caloric requirements. Recommended servings for calorie levels of 1,600, 2,200, and 2,800 are presented in Table 1.

For each of the five food group components of the Index, individuals who consumed the recommended number of servings received a maximum score of 10. A score of zero was assigned to any food group where no items from that category were consumed. Intermediate scores were calculated proportionately to the number of servings consumed. For example, if the recommended level of servings was eight and an individual consumed four servings, the component score for the individual was 5 points. A score of 7.5 points was assigned if six servings were eaten.

In developing the Index, serving recommendations from the *Food Guide Pyramid* were interpolated to individuals with other food energy requirements. For example, food energy RDAs for children between 1 and 3 years of age are less than 1,600 kilocalories. The recommended number of servings was retained at the minimum serving level for these children, but the serving size was scaled down to be proportionate with their energy requirements. This approach was consistent with the guidance contained in the *Food Guide Pyramid*. In contrast, adult males between the ages of 15 and 50 have food energy RDAs slightly greater than 2,800 kilocalories. The text of the *Food Guide Pyramid* provides no guidance as to how to adjust serving sizes to meet calorie levels above 2,800 kilocalories. Instead of slightly increasing serving sizes, it was decided that food portions for these individuals would be truncated at the maximum levels recommended in the *Food Guide Pyramid*. It should be noted, based on preliminary analysis, none of the results from the Index were shown to be significantly affected even if a slightly larger serving size were used.

Table 2 shows the serving recommendations for various age/gender categories.

Table 1

Recommended Numbers of Servings Per Day at Food Energy Levels Discussed in the Food Guide Pyramid Bulletin (USDA, 1992)

	Number of Servings				
Kilocalories	Grains	Vegetables	Fruits	Milk	Meat
1600	6	3	2	2	2
2200	9	4	3	2	2.4
2800	11	5	4	2	2.8

Some people need more servings from the food groups than others.

Table 2

Recommended Number of Servings Per Day for Age/Gender Categories

Age/Gender Category	Kilocalories	Grains	Vegetables	Fruits	Milk	Meat
Children 1-3	1300	6[a]	3[a]	2[a]	2[a]	2[a]
•	1600	6	3	2	2	2
Children 4-6	1800	7	3.3	2.3	2	2.1
Females 51+	1900	7.4	3.5	2.5	2	2.2
Children 7-10	2000	7.8	3.7	2.7	2	2.3
Females 11-50	2200	9	4	3	2[b]	2.4
Males 51+	2300	9.1	4.2	3.2	2	2.5
Males 11-14	2500	9.9	4.5	3.5	3	2.6
•	2800	11	5	4	2	2.8
Males 19-50	2900	11	5	4	2[b]	2.8
Males 15-18	3000	11	5	4	2	2.8

[a]Portion sizes are reduced for children age 1-3.
[b]Is 3 for persons age 11 to 24.
•RDA levels included in the Food Guide Pyramid bulletin.

Other Components of the Healthy Eating Index

Fat and Saturated Fat

Index scores for fat and saturated fat intakes were examined in proportion to total food energy (or calories).

- Fat intakes less than or equal to 30 percent of the total calories were assigned a score of 10 points. The score declined to zero when the proportion of fat to total calories reached 45 percent. Intakes between 30 percent and 45 percent were scored proportionately.
- A score of 10 points was assigned to saturated fat intakes at less than 10 percent of total calories. Zero points were assigned when the saturated fat intake reached a level of 15 percent of the total calories. Scores between the two cutoff values were calculated proportionately.

Cholesterol and Sodium

The scores for cholesterol and sodium were each based on milligrams consumed.

- A maximum point value for cholesterol was assigned when intake was at a level of 300 milligrams or less. Zero points were assigned when intake reached a level of 450 milligrams or more. Values between the two cutoff points were scored proportionately.
- A maximum score for sodium was assigned at an intake level of 2,400 milligrams or less. Zero points were assigned at a level of 4,800 milligrams or more. Scores between the two levels of intake were scored proportionately.

Variety

Dietary variety was assessed by totaling the number of "different" foods eaten by an individual in amounts sufficient to contribute at least one-half of a serving in a food group. Similar foods were grouped together and counted only once in measuring variety. Food mixtures were broken down into their component ingredients and assigned to the relevant food groups. Index scores for variety were calculated in a manner analogous to the method used for the other Index components. Cutoff scores for variety were defined based on 3 days of recorded data. A maximum score was given if 16 or more different food items were consumed over a 3-day period. A score of zero was given if six or less different items were eaten. When based on 1 day of reported data, the cutoff scores for variety were reduced by a factor of two. Intermediate intakes were calculated proportionately.

Study Results

Data Used To Calculate the Healthy Eating Index

The Continuing Survey of Food Intakes by Individuals (CSFII) provides information on the Nation's consumption of foods and nutrients, and the dietary status of individuals. In addition to dietary intake information, the CSFII contains extensive data about personal and socio-economic characteristics and knowledge of, and attitudes toward, healthful eating practices. The survey sample included individuals in households with incomes at all levels. Three days of dietary intake data were collected. Dietary recall information was collected on the first day during an in-person interview. Respondents completed a food record for the second and third days. Although lower income groups were oversampled in conducting the surveys, weights were available for making the sample representative of the U.S. population.

The Index was applied to the USDA 1989 and 1990 CSFII. Most of the analysis conducted focused on individuals 2 years of age and older for whom 3 days of dietary intake data were available. Sample sizes were approximately 4,000 for the 1989 survey and 3,400 for the 1990 survey.

Average Overall Scores

The maximum overall score for the 10 components of the Index is 100 points. Average overall scores on the Index for the 1989 and 1990 CSFII are 63.8 and 63.9, respectively. The values of the Index are quite similar for both years with the majority of scores ranging between 51 and 80. Approximately 12 percent of persons have index scores above 80 while 14 to 15 percent have index scores of 50 or below. The distribution of individuals by Index scores is presented in Table 3.

The Average Score on the Healthy Eating Index is similar for 1989 and 1990. Most people fall in the middle range between 51 and 80.

Table 3

Distribution of Individuals by Healthy Eating Index Level, 1989, 1990[1, 2]

Level of Index	1989*	1990
0-30	[a]	[a]
31-40	2%	3%
41-50	12%	12%
51-60	26%	23%
61-70	28%	29%
71-80	22%	21%
81-90	10%	10%
91-100	1%	2%
Mean	63.8	63.9
Sample Size	3997	3400

[a] Less than 0.5 percent.
[1]Weighted data, composed of individuals ages 2 and older; 3-day data
[2]Data from Continuing Survey of Food Intakes by Individuals, 1989, 1990 U.S. Department of Agriculture
*May not add to 100% due to rounding

In an effort to provide a "rating" of the overall American diet, a grading scale was developed. The grading scale used to classify Index scores is presented in Table 4 along with the percent of individuals receiving a particular rating.

The majority of individuals have diets rated as "Needs Improvement." Eleven to 12 percent of individuals have diets rated as "Good" whereas 14 to 15 percent have diets rated as "Poor."

The majority of people fall in the "Needs Improvement" category. Smaller percentages fall in the "Good" or "Poor" categories.

Table 4

Healthy Eating Index Grading Scale

HEI Scores	Rating	Percent of Sample
Greater than 80	Good	11 - 12
51 - 80	Needs Improvement	73 - 76
Less than 51	Poor	14 - 15

Component Scores

People do worst on the consumption of Fruits and Saturated Fat. These are the areas that need most improvement.

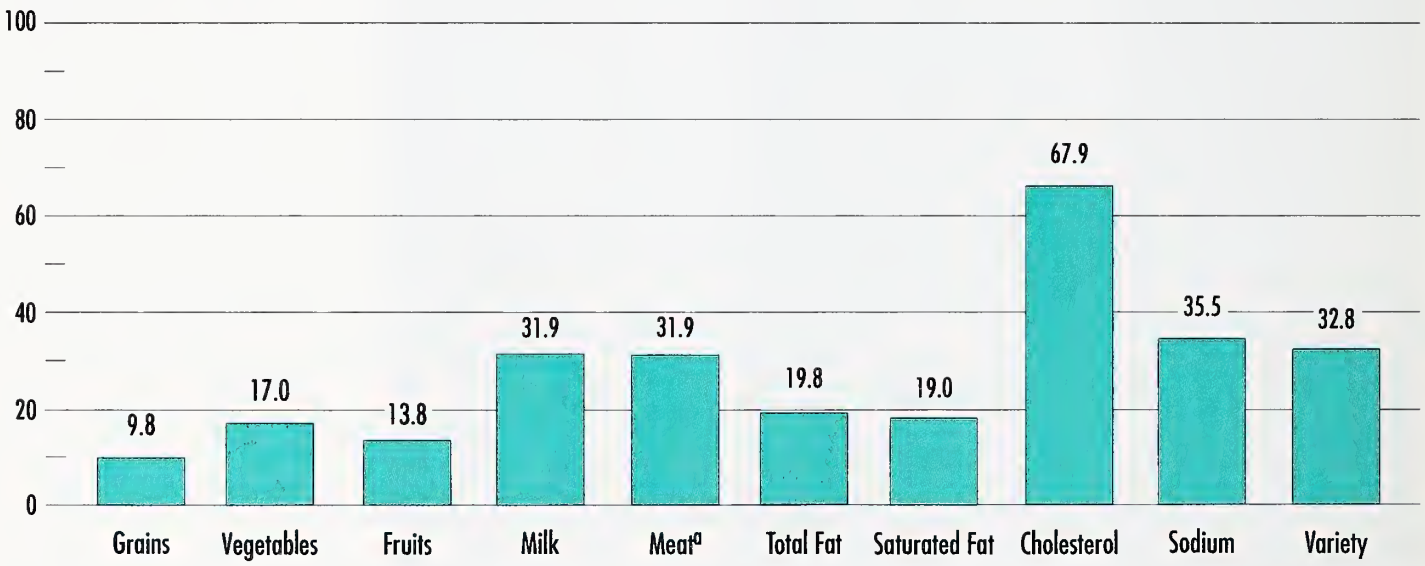
There is significant variation in average scores among the individual components of the Index. No one category contributes disproportionately to the average score. Some key patterns across Index components become apparent in examining the percent of observations at maximum scores of 10. Mean component scores and percent observations at the maximum scores are presented in Tables 5a and 5b.

High component scores are indicative of intakes within recommended ranges. The lower the component score, the poorer the conformance to recommended intake levels. Mean scores for the different components range from 4.0 to 7.9. Fruits (4.0) and saturated fat (5.0) had the lowest mean component scores, indicating they are the areas needing greater improvement. The highest mean component scores were for cholesterol (7.9) and meats (7.5). Sodium (7.0) and dietary variety (7.0) also had a relatively high proportion of people at the maximum.

Table 5a

Levels of Healthy Eating Index Components[1]

Percent of People Receiving a Score of 10



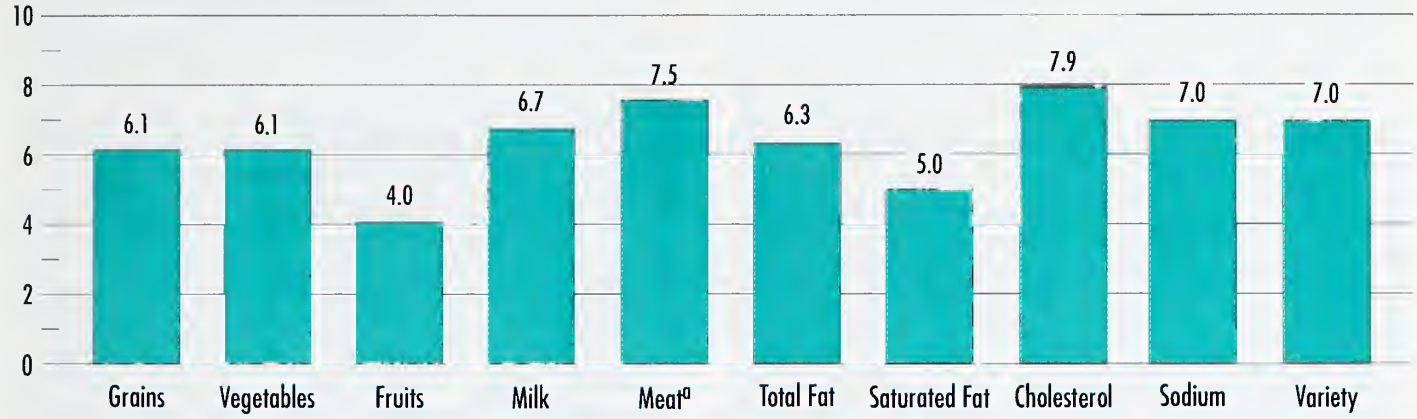
[a]Includes eggs, nuts, and some legumes.
[1]1989 Weighted data; Individuals Ages 2+; 3-day data
Data from Continuing Survey of Food Intake by Individuals 1989 - U.S. Department of Agriculture.

Table 5b

Levels of Healthy Eating Index Components[1]

People's Average Score

Representative Sample of American Population



[a]Includes eggs, nuts, and some legumes.

[1]1989 Weighted data; Individuals Ages 2+; 3-day data

Data from Continuing Survey of Food Intake by Individuals 1989 - U.S. Department of Agriculture.

Differences by Personal and Household Characteristics

People's Healthy Eating Index scores improve with increasing education. Increasing income has a more modest effect on the overall score.

The Index scores for weighted 1989 and 1990 CSFII data were stratified by selected indicators. Table 6 summarizes the mean Index scores for the five indicators analyzed (sex, age, head of household, educational level, and income as a percent of poverty).

Index scores by indicator were similar for 1989 and 1990. Females have a higher average Index than males. Persons in the younger and older age groupings have a higher Index than those in the middle age groupings. Individuals living in either jointly headed or female-headed households have a higher Index than individuals living in male-headed households. Index scores generally increase with increasing levels of education. Average Index scores were highest for individuals having 4 or more years of college education. The Index generally responds more to increases in education than increases in income. Overall, the average Index was higher for individuals at 201 percent of poverty or over than for those at lower poverty levels.

Table 6

Mean Dietary Index Weighted 1989 and 1990

Eating Index Score	1989 Mean	1990 Mean
Sex		
Male	62.0	60.0
Female	65.6	65.0
Age		
5-14	66.1	66.4
15-39	60.5	60.2
40-64	63.5	64.2
65+	69.2	69.0
Head of Household		
Male & Female Head	64.1	64.0
Female Head	64.5	64.9
Male Head	58.8	60.5
Education Level		
<2 Yrs. High School	60.9	59.4
2-3 Yrs. High School	59.7	60.5
4 yrs. High School	62.3	60.9
Some College	63.9	65.0
4 Yrs. College	65.8	66.3
>4 Yrs. College	68.2	68.0
Indeterminable	67.1	66.7
Income as a % of Poverty		
0-50%	59.5	61.7
51-100%	61.2	59.7
101-130%	62.0	63.9
131-200%	62.0	62.4
201-300%	63.3	63.9
301% plus	65.4	65.1

Correlations with Meeting Recommended Dietary Allowances

The Index was compared to nutrient intake as a percent of the RDAs to assess the degree to which it correlates with other conventional measures of diet quality. In that the RDAs are set to be higher than the level needed by most individuals, the criterion of meeting 75 percent of an RDA was selected. Table 7 shows the relationship between key nutrients and scores on the Index.

A higher Index score is associated with an increased likelihood that at least 75 percent of the RDA for most nutrients will be met. Nutrient intake improves as the Index score improves. For example, only 49 percent of the individuals with Index scores 50 or less have Vitamin C intakes greater than 75 percent of the RDA. With an Index score between 71 and 80, the likelihood increases to 90 percent. With Index scores of 80 or above, the likelihood increases to nearly 99 percent.

Index tabulations were also performed using a criterion of meeting 100 percent of the RDA. Results are essentially the same as those for meeting 75 percent of the RDA.

Correlation coefficients provide a statistical measure of the Index's ability to rank individuals along a distribution of high intake to low intake. The correlation coefficients between the Index and nutrient intake levels confirmed a positive relation for each of the nutrients analyzed. Correlation coefficients were in the range of 0.30 to 0.40 for 5 of the 17 nutrients analyzed. A modest correlation (0.18) exists between food energy and the Index, of indicating that an increase in the calorie level will not by itself dramatically improve the Index.

People who have a better Healthy Eating Index score are more likely to have a better nutrient intake.

Table 7

Percent of Observations Meeting 75 Percent or More of RDAs by HEI Levels

Nutrient	Index Score					Correlation Coefficients of Index with Nutrient
	0-50	51-60	61-70	71-80	81-100	
Food Energy	35.6	47.7	47.0	55.3	63.1	.18
Protein	86.3	90.3	94.0	98.1	99.7	.18
Vitamin A - IU	41.1	54.7	65.2	83.1	90.3	.22
Vitamin A - RE	37.3	50.0	58.9	74.8	86.1	.21
Vitamin E	34.5	44.2	45.8	51.0	64.5	.12
Vitamin C	49.3	67.7	82.3	90.5	98.8	.39
Thiamin	62.9	81.7	91.1	96.1	96.9	.30
Riboflavin	72.6	83.2	86.0	93.7	98.7	.23
Niacin	74.7	84.9	93.9	97.0	98.4	.29
Vitamin B6	35.9	50.7	67.8	80.4	91.4	.36
Folate	58.1	74.3	87.8	93.0	98.0	.38
Vitamin B12	87.5	93.1	93.8	95.6	98.1	.03
Calcium	35.8	51.4	50.7	65.4	66.0	.12
Phosphorus	75.5	83.7	89.5	95.7	98.2	.10
Magnesium	30.3	45.3	58.7	72.2	90.5	.40
Iron	59.4	67.2	75.2	82.8	87.4	.17
Zinc	43.9	43.5	42.8	51.5	51.4	.04

Other Tabulations

Comparison of Index Scores for 1 Day Versus 3 Days of Dietary Intake

Many dietary surveys include only one day of food consumption data. To test its use on a single day of data, the Index was applied to the first day of the 3-day sample. With the exception of variety, the parameters used on the 1-day data set were the same as those used on the 3-day data set. It is not reasonable to expect that the number of foods eaten in 1 day would equal the number of foods eaten over a 3-day period. In computing the variety component for the 1-day tabulations, the number of foods needed to receive the maximum score was reduced by a factor of two, from 16 foods to 8 foods.

A comparison of 1-day versus 3-day Index scores is presented in Table 8. The pattern of results for 1 day of intake is similar to that for 3 days of intake, although most of the component scores are somewhat lower for a 1-day intake. Overall, the average value falls from 63.8 to 61.4. Consistent with the 3-day findings, fruits and saturated fat have the lowest component scores, followed by grains, vegetables, and total fat.

Daily variations in an individual's dietary intake provide one possible explanation for the higher scores in the 3-day data compared to the 1-day data. If an individual has an exceptionally high component score on 1 of the 3 days analyzed, this high score is averaged with the component scores for the other 2 days.

Similar results are found with 1-day and 3-day dietary intake data. This is encouraging since most surveys collect only 1 day's dietary information.

Table 8

One-Day Versus Three-Day Index Scores, 1989[1]

Index Component	Three-Day Mean*	One-Day Mean*
Grains	6.1	6.1
Vegetables	6.1	5.9
Fruits	4.0	3.7
Milk	6.7	6.2
Meat	7.5	7.1
Total Fat	6.3	6.3
Saturated Fat	5.0	5.4
Cholesterol	7.9	7.5
Sodium	7.0	6.7
Variety	7.0	6.6
Total	63.8	61.4

[1]Weighted data, individuals ages 2 years and over, CSFII 1989
*May not add due to rounding

Comparison of Index Score and Individual's Self-Rating of Diet

In addition to dietary intake information, the CSFII contains information on the self-rating of dietary patterns. The Index score was compared to an individual's rating of his or her diet to examine how accurately he or she assesses dietary quality. A comparison of Index scores and self-ratings of diet for weighted CSFII 1990 data is shown in Table 9. Results were similar for CSFII 1989 data.

Individuals who rate their diet as "Excellent" have a higher average Index score than persons who rate their diet as "Very Good," "Good," "Fair," or "Poor." Those individuals rating their diets as "Excellent" are also less likely than persons in the other categories to have an Index score below 40. Similarly, individuals who rate their diet as "Poor" are more likely to have an Index score below 40 and less likely to have an Index score above 80. These results indicate that individuals are fairly accurate in assessing the quality of their diets and that factors other than knowledge affect good eating habits.

Individuals who self-rate their diets as "Excellent" have a higher Index score than individuals who rate their diets as "Fair" or "Poor."

Table 9

Healthy Eating Index Score Compared to Individual's Self-Rating of Diet, Weighted 1990 Data

Self-Rating	Sample	HEI	HEI SCORE			
			<40	40- 60	61-80	81-100
	%	MEAN	%	%	%	%
Excellent	16.3	67.6	2.2	26.9	52.3	18.7
Very Good	29.2	65.4	2.2	32.0	50.7	15.1
Good	39.0	63.2	3.1	35.9	51.5	9.5
Fair	11.9	59.9	3.7	49.1	42.9	4.3
Poor	3.1	55.8	11.6	43.8	43.4	1.2

Conclusions

Implications

• The diets of most Americans need improvement.

Only 12 percent of Americans had scores on the Healthy Eating Index that were 80 or above. The average scores for the 2 years studied were similar at 63.8 and 63.9. One-third or less of the people surveyed consumed the suggested number of servings from the 5 major food groups. People were most likely to underconsume in the fruit, vegetable and grain groups. In addition, variety in the diet was limited and intakes of total fat and saturated fat were above recommended levels for more than 80 percent of the individuals studied.

• Some individuals are more likely than others to consume a poor diet.

Although the average Healthy Eating Index score for most people needs improvement, some individuals are at a higher risk of a low Index. Persons from low-income households, individuals with less education, and persons in the 15 to 39 year age category were most likely to have lower average scores on the Healthy Eating Index.

• The Index provides a standard for assessing overall dietary quality.

Based on the most current scientific information available, including the *Dietary Guidelines for Americans* published by USDA and DHHS, and the *Food Guide Pyramid*, the Index was developed to provide a single summary measure of dietary quality. The Index is based on the five major food groups from the *Food Guide Pyramid* and the *Dietary Guidelines*. The Index is a practical standard for assessing dietary quality.

The Index correlates well with other conventional measures of diet quality. Comparisons with RDA levels confirm a positive correlation between the Index and individual nutrient intake levels. Higher Index scores are associated with improved nutrient intakes.

• The Healthy Eating Index reflects the complexity of dietary patterns.

Ten dietary components comprise the Index. All 10 components contribute evenly to the overall Index score. Doing well on one component does not ensure a high score on the overall Index. Overall dietary quality is reflected in the total Index score and is not determined based on any individual component score. Using one component score, such as percent of calories from fat, as an indicator of dietary quality can result in misclassifications.

There is significant variation in average scores among the individual Index components. Fruits and saturated fat have the lowest average component scores, indicating that consumers are doing the poorest in these areas. Of all individuals, less than 20 percent achieved recommended levels in the grains, fruits, vegetables, total fat, and saturated fat components. Only in the cholesterol component did greater than 50 percent of individuals achieve a perfect score.

USDA Applications

Practical applications of the Healthy Eating Index results are identified below.

- **The results of the Index are useful in targeting nutrition education and health promotion activities.**

Results of the Index provide insights into the types of dietary changes needed to improve American eating patterns. A two-tiered approach is warranted. First, nutrition promotion activities are required to address the nutritional needs of all Americans. To that end, USDA is proposing a general nutrition education and nutrition promotion initiative for all Americans as part of the 1995 Farm Bill. In addition, the recently implemented Schools Meals Initiative for Healthy Children ensures that the nutrition standards for school meals meet the Dietary Guidelines. This is complemented by Team Nutrition which focuses on empowering children to make food choices for healthful diets.

Targeted strategies for nutrition promotion are also needed. Results from this research suggest that individuals from low-income households and less-educated people are more likely to score lower on the Healthy Eating Index. Therefore, efforts are already underway within USDA to integrate nutrition into all of the food assistance programs.

- **The Healthy Eating Index is a single summary measure of diet quality that can be used to monitor changes in food consumption patterns over time.**

In this study, the Index was applied to the 1989 and 1990 CSFII data to evaluate the overall quality of American diets. Average scores for the overall Index for both years are approximately 64 percent, a score judged as "Needs Improvement." HEI values are similar for both years, indicating that dietary intake does not vary greatly from year to year. USDA intends to use the Index as one method to monitor changes in dietary patterns in the United States population over time. The Index will be periodically published as nationally representative dietary survey data become available.

- **The Index could provide the basis for development of a variety of additional tools.**

The Healthy Eating Index provides one instrument that will be useful in monitoring trends in U.S. consumption patterns over time. This will provide policymakers with the capability of revising and fine-tuning specific programs in a more timely manner to be responsive to the changing nutrition profile of the population.

In addition, a self-assessment instrument would be of use to the American consumer in that it would provide a standard against which an individual could evaluate the quality of his/her own diet. In addition, a self-assessment instrument could serve as a useful guide to consumers in helping them select the types and amounts of foods needed to achieve recommended intakes. The Index would provide a basis for the development of such an instrument.

It is the intention of the USDA Center for Nutrition Policy and Promotion to begin developing a consumer-oriented, self-assessment guide following the public release of the Healthy Eating Index.

Technical Issues

The following technical issues were considered critical to the development of the Healthy Eating Index:

- **Determination of Portion Sizes**
- **Allocation of "Mixtures" to Individual Food Groups**
- **Estimation of Food Group Serving Requirements by Age and Gender**
- **Coding Structure Used To Compute the Index Variety Component**
- **Design Alternatives: What To Count**
- **Other Components**

Determination of Portion Sizes

Serving sizes used to compute the Index scores were intended to be as consistent as possible with those presented in the *Food Guide Pyramid*. Identification of the key underlying commodities contained in various foods and determination of appropriate serving size conversion factors provided a basis for the approach used.

Serving amounts for breads and grains were determined according to an "equivalent flour" approach. For example, the *Food Guide Pyramid* designates a slice of bread as one serving. A typical slice of bread contains 17 grams of flour. The number of servings for any bread on the Index was calculated based on the number of grams of flour it contained divided by the number of grams of flour contained in a slice of bread (17). Similar approaches were applied to pastas and cereal grains.

The *Food Guide Pyramid* counts 1/2 cup of most cooked vegetables, 1 cup of most raw leafy vegetables, and 1/2 cup of most raw nonleafy chopped vegetables as single servings. Different vegetables have different densities, resulting in different gram weights per cup or half-cup measures. Different gram/serving size factors were used to calculate the index for most vegetables, based on the weight of a cup or half-cup of the relevant commodities.

Fruits were treated similarly to vegetables. Gram/serving size factors were developed for each fruit based on the weights of the various fruit amounts.

Serving amounts for various kinds of milk and milk products were calculated based on the grams of nonfat milk solids contained in a food divided by the amount of grams of nonfat milk solids contained in 1 cup of milk (the serving size specified for milk in the *Food Guide Pyramid*). To determine a serving size for different cheeses, the weight of all milk products in a cheese was totaled and then divided by the conversion factor used in the *Food Guide Pyramid* for cheese.

Serving sizes of meats are specified in the *Food Guide Pyramid* in terms of 2 - 3 ounces of lean meat. The Index calculations assume a serving size of 2.5 ounces for meats. Serving size conversion factors for meats were based on the amount of fat-free meat commodity included in the database for various foods. Conversion factors for converting grams of nuts and peanut butter to serving sizes were developed according to those specified in the *Food Guide Pyramid*. The gram conversion factors developed were based on the weight of these quantities.

Allocation of Mixtures to Individual Food Groups

In calculating the Index, it was necessary to assign the foods in "mixtures" to their constituent food groups in the appropriate amounts. Pizza, for instance, may make significant contributions to several different food groups, including grains, vegetables, milk, and meat.

The approach used was a straightforward extension of the approach used to estimate serving sizes. Commodity compositions of foods were identified. Once identified, commodities were assigned to appropriate food groups, based on the gram/serving size factor calculated.

Estimation of Food Group Serving Requirements by Age and Gender

Prior to scoring the first five components of the Index, it was necessary to determine the recommended numbers of servings by food group for each of the individuals on the data file. The food energy RDAs for some age/gender combinations were different from the three levels of energy intake presented in the *Food Guide Pyramid*. Interpolation techniques were used to estimate the required number of servings for age/gender combinations not addressed in the *Food Guide Pyramid*. Food servings specified in the *Food Guide Pyramid* for three food energy RDA levels were used as a basis for predicting comparable food servings at other food energy levels for each food group.

Two issues arose in taking this approach. Children 1 - 3 years of age have a food energy RDA less than the lowest calorie level in the *Food Guide Pyramid*. Extrapolation of the *Food Guide Pyramid's* recommended number of servings to a lower calorie level would result in smaller numbers of servings than the minimums shown. The following statement from the *Food Guide Pyramid* provided a basis for the technical approach taken to address the issue:

Preschool children need the same variety of foods as older family members do, but may need less than 1,600 calories. For fewer calories, they can eat smaller servings.

The number of servings for children 1 - 3 years of age was thereby held constant at the minimums shown in the *Pyramid*, but the serving sizes were reduced proportionately.

Similarly, males 15 - 50 years of age have food energy RDAs slightly higher than the highest calorie level in the *Food Guide Pyramid*. Simple extrapolation would result in larger numbers of servings than the maximum numbers shown. The text of the *Food Guide Pyramid* provides no guidance regarding the adjustment of numbers of servings or serving sizes to accommodate higher food energy levels. Rather than exceeding recommended serving sizes, it was decided that food servings would be truncated at the maximums shown in the *Food Guide Pyramid*. Preliminary analysis indicated that if serving sizes had been slightly increased, the results obtained from the Index would not have been significantly different.

Coding Structure Used To Compute the Variety Component of the HEI

The food coding structure used to compute the Index was based on USDA's coding structure for data in the 1989 and 1990 CSFII. In an effort to simplify coding, items which were similar but coded separately in CSFII were grouped together for the purposes of this study. The following principles guided the coding decisions made:

- Only foods judged nutritionally similar were grouped together.
- Foods made with separate commodities were generally grouped separately.

- Foods differing only in fat content were generally grouped together.
- Vegetables were each given separate codes, but different forms of the same vegetable were coded together.
- Different forms of the same meat were generally coded the same. Organ meats and ham were two exceptions.
- Each type of fish was given a separate code, but different forms of the same fish received the same code.
- Most forms of fluid milk had the same code. Pudding was coded separately from milk.
- Most cheeses had the same code with the exception of cottage cheese.
- All white bread was given the same code. Sweet rolls and pasta received different codes.
- Whole wheat products were coded differently from products made with refined wheat flour.
- Ready-to-eat cereals made principally from the same grain received the same codes; those made from different grains received different codes.

In an effort to facilitate coding, food mixtures were broken down to their constituent components. Only component foods present in substantial quantities were included in the variety calculations. A threshold of 1/2 a *Food Guide Pyramid* serving was used. Food components contributing less than 1/2 a *Food Guide Pyramid* serving were not computed in the Index variety score. It is possible that variety scores for some individuals were slightly underestimated by this approach. Several servings in a food group consumed in less than 1/2 serving amounts throughout a day could exceed the 1/2 serving threshold when added together. The potential effects of this underestimation on the final results is believed to be extremely small.

A second simplifying convention used was to assume that food mixtures containing two or more components from the same food group (e.g., mixed vegetables) could be reasonably allocated, equally, to two codes representing the components present in the highest proportions.

Design Alternatives: What To Count

Foods often principally fall within one group but contain small amounts of other groups. Bread, for example, is mainly a grain but also contains small amounts of milk and egg products. An approach considered for this study was to exclude the "incidental" food group contributions from the computations. This approach was rejected based on the following rationale:

1) Even relatively small amounts of incidental foods contribute to an individual's overall nutrient intake.
2) Suppressing the incidental foods would have often involved arbitrary judgements for establishing minimum size cutoffs.

It was decided that all contributions to various food groups would be counted in computing the Index with no minimum size cutoff values imposed. The following examples illustrate some of the implications of this approach:

- The nutrition value from condiments, such as mayonnaise, was counted in computing the Index.
- The nutrition value of milk used in some sweets, such as a milk chocolate bar, was counted in the milk group in computing the Index. If allocated to a single food group, the overall food would be assigned to the "Sweets" group and not counted in the Index.
- The fruit juice in a soft drink which is at least 10 percent fruit juice was counted in computing the Index. The water and sugar contained in the soft drink were not counted.
- The potato content of potato chips was counted in computing the In-

dex. The fat content was not counted in computing the vegetable and variety components of the Index but was counted in computing the fat component.

Other Components

In developing the Index, consideration was given to including a component to address food energy intake. Obesity is a significant health problem in this country. Nevertheless, it was decided that the inclusion of physical measures of appropriate body weight, such as a body mass index (BMI) or conformance to standard weight-for-height tables, would be inappropriate since they are influenced by factors, such as physical activity, unrelated to people's eating patterns. Use of a measure based on food energy in relation to the RDA was also rejected for this study, as preliminary tabulations of the data indicated that these measures were not highly correlated with physical measures of obesity. A comparison of the BMI and caloric intake is presented in Table 10.

BMI values from 24 to 27 in women or 25 to 27 in men indicate overweight; those over 27 indicate obesity. In Table 10, persons with a BMI of greater than 30 have a level of energy intake similar to individuals with a BMI of 20 or less. Thus, BMI is not highly correlated with caloric intake.

Caloric intake does not predict obesity very well.

Table 10

Energy Intake as a Percentage of RDA Versus Body Mass Index

% Kilocalories	BMI				Row % (n)
RDA[1]	15-20	20-25	25-30	>30	Total
<60%	3.17	36.41	43.17	17.26	24.25 (280)
60-80%	4.05	40.51	39.89	15.55	33.08 (397)
81-100%	4.92	43.21	36.02	15.86	24.29 (272)
101-120%	3.91	38.62	48.70	8.77	11.29 (125)
>120%	3.10	46.41	40.81	9.68	7.09 (79)
Column percent	3.96	40.37	40.80	14.86	100.00

Comments:
Population is adult males age 18-74.
BMI = weight/height*height.
RDA[1] = energy intake as a percent of RDA.
Correlation coefficient: r = 0.02594 (p<0.38).